

REMARKS

Amendments to the Claims

Upon entry of the present amendments, claims 24-27 are cancelled and new claims 34 and 35 are added, which leaves claims 29-35 are pending.

Claim 29 is amended to better accord with the language of claim 30, from which it depends.

New claim 34 is identical to existing claim 30, except claim 34 specifies that the stencil includes “slots” along its edges, whereas claim 30 specifies that the stencil includes “receiving apertures” along its edges. Support for this amendment is found, *e.g.*, in the first full paragraph on page 5; in the paragraph bridging pages 5 and 6; and in the second paragraph on page 7.

New claim 35 is similar to claim 34, except claim 35 also includes a support frame having displaceable support surfaces that engage the edges of the stencil at a plurality of locations along each edge. Support for this amendment is found, *e.g.*, at page 2, first full paragraph; page 4, first paragraph; page 5, first full paragraph; and in the paragraph bridging pages 7 and 8.

Accordingly, the present amendment does not introduce new matter.

Each of the grounds for rejection cited in the Office Action is addressed below, under an appropriate sub-heading.

35 U.S.C. §103(a)

Claims 24-27 and 29-33 have been rejected under 35 U.S.C. §103(a) as being unpatentable over GB 2,264,460 in view of US 2,073,379 (Rasmussen). Claims 24-27 have been cancelled, thereby obviating this rejection. New claims 34 and 35 are also compared with the cited references, below.

The comments, below, build upon the evidence and arguments that were previously presented. Hence, the previous arguments (with minor modifications accounting, *e.g.*, for amendments to the claims) are first presented, below, followed by the new evidence and arguments presented in the discussion of the new Declaration of Valentijn Van Velthoven.

Review of Arguments Previously Presented:

The stencil claims (*i.e.*, claims 29-34) specify that the stencil includes a metallic body or metallic sheet through which receiving apertures or slots are formed along each edge.

The metallic stencils described in the pending claims can be used for printing solder paste in a particular pattern onto a circuit board, as suggested in the opening paragraph of the specification.¹ The apertures/slots along the four edges of the metal stencils enable tension to be applied substantially uniformly across the metal stencil along more than one axis without significantly stretching the metal stencil and avoiding or minimizing bowing of the stencil.² The substantially inelastic character of the metal stencil enables the metal stencil to be reliably used in printing solder paste onto circuit boards where the size, shape and position of the solder deposits must be carefully controlled via a fixed size, shape and position of the print apertures in the stencil.

GB 2,264,460 discloses a metallic stencil having receiving apertures along just two edges, while Rasmussen discloses a highly elastic rubber stencil having eyelets along four sides. Although Rasmussen discloses the provision of apertures along four edges of a highly elastic organic stencil, the elastic character of this stencil would render it unsuitable for printing applications, such as solder printing on printed circuit board (PCB) contact pads, where the size, shape and position of the apertures must be fixed and tightly controlled. Further, no suggestion or motivation is provided for exporting this teaching (*i.e.*, of providing apertures along more than two edges) from an elastic rubber stencil to a metallic stencil, as required in Applicant's independent claim 30.

The "highly elastic"³ character of the Rasmussen stencil enables the aperture design to be "expanded or contracted . . . or elongated in one direction"⁴ via application of tension through

¹ Present application (USSN 09/586,824), page 1, first paragraph ("The present invention is primarily concerned with means for applying solder paste to circuit boards . . .").

² See *id.*, page 11, lines 3-6 ("Additionally, the springs maintain the stencil in tension and when in use and enable the provision of a strong even pressure and bowing of the sidewalls is avoided or minimized."); Declaration of V. Van Velthoven, paragraphs 6 and 10.

³ U.S. 2,073,379 (Rasmussen), Col. 2, lines 10-18 and 42-48.

⁴ *Id.*, Col. 1, lines 1-11.

the apertures along the four edges to thereby stretch and expand the shape of the print produced with the stencil.⁵ However, neither Rasmussen nor GB 2,264,460 in any way suggests the combination of their teachings. To the contrary, GB 2,264,460, in describing a typical solder stencil, specifies that “a solder stencil or mask comprises a thin but still relatively *stiff* sheet of stainless steel or brass.”⁶ GB 2,264,460 further specifies that its stencil (unlike the Rasmussen stencil) is tensioned “without distortion.”⁷ Consequently, the motivation in Rasmussen of enabling the stencil to be stretched via tension applied to the apertures is not consistent with the described character of the metal stencil in GB 2,264,460 (*i.e.*, having a structure that is intended *not* to stretch).

Moreover, GB 2,264,460 teaches against providing apertures or slots along all four edges of the stencil because it claims that the provision of two flexible edges with closely spaced apertures make it “possible to avoid the transmission of any tensioning distortions to the main body of the mask.”⁸ At the time, it was not realized that the sides of the stencil could nevertheless bow when tension was applied to only two sides.

Because the prior art does not teach or suggest the inclusion of plural apertures or slots along more than two edges of a stencil where the stencil is formed of *metal*, Applicant respectfully submits that no motivation is apparent for combining the teachings relating to the highly elastic rubber stencil in Rasmussen with the teachings relating to the metal stencil in GB 2,264,460. Because new claims 34 and 35 include metallic stencils having more than two slots along each peripheral edge, these new claims, like the previously pending claims, are non-obvious over the cited art.

New Declaration of Valentijn Van Velthoven:

Additional evidence of the non-obviousness of the stencils described in the claims is found in the Declaration of Valentijn Van Velthoven, a copy of which is appended hereto, which

⁵ Illustrations of stretched stencils are provided in FIGS. 5 and 6 (compare with FIG. 4) of U.S. 2,073,379.

⁶ GB 2,264,460, page 1, 2nd paragraph (emphasis added).

⁷ *Id.*, page 10, last line, and page 10, 2nd paragraph.

⁸ *Id.*, page 13, 1st full paragraph.

compares the claimed stencil with those described in the cited references and which discusses secondary considerations pertaining to non-obviousness, particularly (a) the commercial success of this stencil (including discussion of market share), (b) the long-felt need in the industry for a viable “frameless” stencil, (c) the failure of others to produce a “frameless” stencil that could compete strongly with the traditional “mesh-and-frame” stencil, and (d) copying by competitors of the four-sided frameless stencil after its introduction into the market, all of which serve as strong evidence that the invention was not obvious to those skilled in the art at the time the invention was made.⁹

As described in paragraphs 7 and 8 of the Declaration (describing efforts since approximately 1989 to satisfy industry needs for an improved stencil), the PCB industry recognized a need for a “frameless” alternative to the traditional mesh-and-frame stencil, wherein stencil manufacturers attempted to produce “frameless” stencils that could favorably compete with the mesh-and-frame stencil after the introduction of the first MicroMount stencil design in about 1989.¹⁰ As is further explained in the Declaration, however, attempts between 1989 and 1998 to meet this need met with only limited success, as commercial sales of frameless stencils remained small.¹¹ Before the introduction of the TETRA stencil, which had slotted apertures along four edges of the stencil, sales of frameless stencils was only about 7,500 stencils per year; and it is believed that none of those stencils had apertures along four sides.¹² In contrast, sales of frameless stencils exploded to about 60,000 stencils per year immediately following the introduction of the TETRA stencil in 1998; and most of those approximately

⁹ For commercial success as evidence of nonobviousness, *see, e.g., In re Tiffin*, 443 F.2d 394, 398, 170 U.S.P.Q. 88, 91 (C.C.P.A. 1971). For long-felt need and failure of others as evidence of nonobviousness, *see, e.g., In re Tiffin*, 443 F.2d at 400, 170 U.S.P.Q. at 93-94; *see also Dow Chem. Co. v. American Cyanamid Co.*, 816 F.2d 617, 623, 2 U.S.P.Q.2d 1350, 1355 (Fed. Cir. 1987); *Rosemount, Inc v. Beckman Instruments, Inc.*, 727 F.2d 1540, 1546, 221 U.S.P.Q. 1, 7 (Fed. Cir. 1984). For copying as evidence of nonobviousness, *see, e.g., Rosemount*, 727 F.2d at 1546, 221 U.S.P.Q. at 7.

¹⁰ Declaration of V. Van Velthoven, ¶¶ 7 and 8.

¹¹ *Id.*

¹² Declaration, ¶¶ 8 and 11.

60,000+ frameless metal stencils sold annually in the printed-circuit-board industry since 1998 have had apertures or slots along four sides, as specified in the amended claims.¹³

The multi-year effort by industry (through 1998) to produce a commercially successful frameless stencil is evidence of the long-felt need for such a stencil. And the very limited success of those efforts, compared with the explosion in frameless stencils after the introduction of the TETRA stencil in 1998, establish that this was a largely unmet need prior to the introduction of this invention. This long-felt need in the industry for a frameless stencil and the substantial failure by others to satisfy this need offer strong evidence that the earlier existence of framed stencils, such as that disclosed in Rasmussen, and of frameless stencils, such as that disclosed in GB 2,264,460 (*e.g.*, the later design of the MicroMount stencil), and knowledge thereof throughout the industry did not render obvious the metal stencil described in the amended claims (having the apertures or slots along four edges), the success of which (as embodied in the TETRA stencil) far surpassed that of the earlier frameless stencils.¹⁴

The inventiveness of this design over the prior art is further bolstered by industry-wide copying of the design, wherein metal stencils were provided with apertures or slots along four edges after the TETRA stencil was introduced to the market.¹⁵ Examples of such stencils are described and illustrated in the Declaration's appendices.

Response to Comments in Office Action Re Previously Filed Declaration:

In the most-recent Office Action, the Examiner, after reviewing the original Declaration of Valentijn van Velthoven, indicated (a) that evidence was lacking to establish long-felt need in the PCB fabrication industry and (b) that the previously filed Declaration of Valentijn van Velthoven was insufficient to overcome the obviousness rejection because it included gross sales figures for stencils and that those gross sales figures did not show commercial sales figures absent evidence of market share, the time period during which the product was sold, or as to what sales would normally be expected in the market.

¹³ Declaration, ¶¶ 11 and 12.

¹⁴ See Declaration, ¶¶ 11 and 12.

¹⁵ Declaration, ¶ 12.

As noted above, the declaration provides evidence of the long-felt need in the PCB fabrication industry in the description of the nine-year industry effort to produce a commercially successful frameless stencil.¹⁶ As is further noted above, the new Declaration provides market-share data indicating that metal stencils upon which the pending claims read (*i.e.*, having apertures or slots along four edges) increased approximately from a frameless-stencil market share of zero to a majority market share upon the introduction of this invention into the market place in 1998.¹⁷ Moreover, since 1998, stencils upon which the present claims read have also captured a percentage of the overall stencil market (a substantial part of about 60,000+ frameless stencils/year) that is much larger than that captured by any frameless stencil before 1998 (where sales of all frameless stencils peaked at about 7,500 stencils/year). No other basis is apparent to explain the magnitude of this commercial success.¹⁸ Sales of the Assignee's TETRA stencil (upon which the present claims read) since 1998 have far outstripped expectations based on previous sales of Assignee's MicroMount stencil that had slotted apertures along just two edges through 1997.¹⁹

In view of this evidence that it was non-obvious to those of skill in the art to modify the MicroMount stencil (or, more generically, the teachings of GB 2,264,460) to provide apertures or slots along four edges of the stencil and absent any suggestion or motivation in the cited references to combine their teachings to produce such a stencil, Applicant respectfully submits that all of the amended claims are non-obvious.

¹⁶ Declaration, ¶¶ 7 and 8.

¹⁷ Declaration, ¶¶ 11 and 12.

¹⁸ Declaration, ¶ 13.

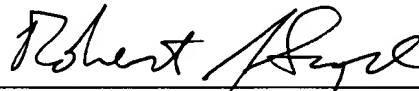
¹⁹ Declaration, ¶ 11.

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CONCLUSION

Applicant respectfully requests that a timely notice of Allowance be issued in this case. If there are any questions regarding these amendments and remarks, the Examiner is encouraged to contact the undersigned at the telephone number provided below.

Respectfully submitted,



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